DOCUMENT RESUME

ED 344 572 IR 015 512

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TITLE Plans and Investments in Educational Technology: A Status Report for the SREB States.
INSTITUTION Southern Regional Education Board, Atlanta, Ga.
PUB DATE 91
NOTE 30p.
AVAILABLE FROM Southern Regional Education Board, 592 Tenth Street, N.W., Atlanta, GA 30318-5790 ($10.00).
PUB TYPE Information Analyses (070) -- Reports - Descriptive (141)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS *Budgeting; Communications Satellites; Computer Software; *Educational Technology; Elementary Secondary Education; *Expenditures; Higher Education; Interaction; Microcomputers; *Statewide Planning; Telecommunications; Teleconferencing

ABSTRACT

This report examines statewide planning and budgeting for educational technology in the 15 states covered by the Southern Regional Education Board (SREB), with a focus on state-level expenditures for telecommunications networks, microcomputers, software, and other technology. Capsule descriptions of each state's current activities are provided, and recommendations for future study are offered. Figures provided in this report were gathered over the past year from state plans and budget reports, and from telephone conversations with individuals responsible for educational technology across the SREB region. The cost figures presented apply to the technologies used in both administration and instruction. Spending patterns in K-12 and higher education are considered, and comparisons between estimated costs and actual expenditures are made when possible. Two tables report the numbers of microcomputers and the amount of video equipment used in K-12 education on a state-by-state basis. The information provded was up-to-date as of October 1, 1991, and covers the states of Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia.
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Plans and Investments in Educational Technology:

A Status Report for the SREB States

SREB
Southern Regional Education Board

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John Kay

592 Tenth Street, N.W. • Atlanta, Georgia 30318-5790 • 1991 • $10

Southern Regional Education Board

PREFACE

SREB states are planning for and investing in educational technology, both in public schools and in colleges and universities. These actions reflect the growing evidence that computer software programs, satellite feeds, electronic bulletin boards, interactive networks, and multimedia equipment can improve classroom instruction. Beyond the classroom, statewide electronic communications systems, "supercomputers," and other advanced technologies are contributing to the capacity of many states in the region to support advanced research and attract high-tech industries.

This status report provides evidence of the challenges that any state or educational institution faces when it enters the technology arena. Rapid, often simultaneous advances in hardware, software, and communications networks make it difficult for policymakers and practitioners to make good decisions about the application of technology. Given the size of the investment required, planning is fundamental; expert advice is critical; and policy flexibility and adaptability is essential.

There is concern that the rapid developments in educational technology are outpacing the training necessary to realize its potential. Teachers, principals, professors, and college administrators remain for the most part poorly prepared to use computers, multimedia systems, or the wealth of video and audio material available over cable and other networks. In the area of greatest investment—public schools—few teachers have progressed beyond the simplest computer operations, and most schools have not even begun to explore ways to fully integrate technology into the daily curriculum. Perhaps of greatest concern, the new generation of teachers is not likely to arrive on the job in a state of "technological readiness"—few colleges and universities use such technology in their teacher preparation programs.

As states in the SREB region explore the potential of educational technology to improve student achievement, they need to address this basic question: Are we in a position to take best advantage of educational technology today and more advantage of the technology of tomorrow?

Mark Musick
President

HIGHLIGHTS

SREB states are moving at different paces to integrate technology in both K-12 and higher education. The following highlights illustrate a few of the many activities in educational technology now occurring in the region.

■ Chief State School Officers (CSSO) have unanimously approved a policy statement on improving student performance through learning technologies.

■ The **Alabama** Department of Education is expected to submit a multi-year request to the 1992 legislature for about $7 million annually in support of educational technology.

■ In **Arkansas**, 19 colleges and universities representing more than 85 percent of the state's student enrollment have organized to form an academic research network, which is also linked to the National Science Foundation Network (NSFNET) for national and international information exchange.

■ In 1989-90, the State University System of **Florida** spent about $166.5 million for information and communication technologies in its institutions and regional data centers.

■ In FY90, colleges and universities in **Georgia** spent over $40 million on computers, printers, software, programming, and repair services.

■ The **Kentucky** Information Systems Commission estimates that total information system expenditures in the state will exceed $233 million in the 1991-1992 biennium.

■ In **Louisiana**, some discussion is underway to establish a state data base committee that would examine the feasibility of a statewide information data base for all agencies.

■ **Maryland** has contracted with Ernst & Young, an internationally recognized accounting and management consulting firm, to examine all spending for information and communication technologies in higher education.

■ **Mississippi** State University and Mississippi University for Women are participating in the Mississippi 2000 project, a public/private initiative involving state universities, public high schools, BellSouth Telecommunications, IBM, Apple Computer, Inc., Northern Telecom, and ADC Telecommunications, Inc.

■ **North Carolina's** governor has created an Advisory Council on Telecommunications in Education, at the request of business and industry, to establish a statewide telecommunications plan.

■ In **Oklahoma**, the governor has recommended spending $50 million to strengthen statewide communications in the public schools.

■ **South Carolina** has issued the findings of a survey of state agencies and institutions of higher learning on current and projected use of video resources for distance learning and other programs.

■ **Tennessee** estimates the cost of promoting the application of technology to all K-12 instructional areas at about $20 million for FY91-92, $40 million in FY92-93, and $50 million annually in FY93-94 through FY95-96.

■ A Senate Bill in **Texas** calls for the development and expansion of an Integrated Telecommunications System (ITS) to serve public education. The ITS network will include various telecommunication technologies capable of providing 1-way video, 2-way voice/data communications.

■ In **Virginia's** public schools, financial assistance for educational telecommunications is being funded at about $2.7 million in FY91-92 and at almost $3 million in FY92-93. The State Board of Education will also provide over $4.7 million in FY91-92 and $5.8 million in FY92-93 to finance technology equipment for local schools as outlined in Virginia's Six-Year Plan for Educational Technology.

■ In **West Virginia**, the Department of Education budgeted about $3.5 million in FY91 for a computer project at the elementary school level. The governor's recommendation and appropriation request to support the project in FY92 totaled over $7 million.

INTRODUCTION

Today, growing emphasis is being given to educational technology as a way to improve learning opportunities and make teaching and learning more effective. In fact, technology has become a major component in educational restructuring and reform initiatives. But the pace at which technology is being integrated into education is slow and uneven.

This report examines state planning and budgeting for educational technology in the SREB region, with a focus on state-level spending for telecommunication networks, computers, software, and other technology. Some states have centralized technology activities through the use of commissions made up of key individuals from education, information resource management, public television, and other state agencies. Other states are more decentralized in their approach to technology planning.

This report includes capsule descriptions of each state's current activities and offers recommendations for future study. Readers are cautioned that recent budget cutbacks in some states may affect the programs and levels of appropriations cited here. The information in this report was up-to-date as of October 1, 1991.

A Note About Methodology

Figures provided in this report were gathered over the past year from state plans and budget reports, and from telephone conversations with individuals responsible for educational technology across the SREB region. The cost figures contained in this report apply to technologies used in administration and instruction. Spending patterns in K-12 and higher education are considered. Comparisons between estimated costs and actual expenditures are made when possible.

Tables 1 and 2 report the number of microcomputers and VCRs used in K-12 education on a state-by-state basis. Caution should be given to interpreting these data. Differences in equipment figures provided by Quality Education Data (QED), a Denver-based marketing-information firm, and by several state education agencies probably result from variations in how computers are defined and from different enrollment figures used to calculate the computer ratios. (Variations are noted in the state summaries for Arkansas, North Carolina, and South Carolina.) State comparisons are further complicated by variations in planning and budgeting strategies across states and agencies.

Since some general revenue appropriations pass through state agencies directly to schools and higher education institutions, total state spending for educational technology is difficult to estimate. Such "pass through" funds ultimately may be used for technology purchases at an institution or school district's discretion. Institutions and districts may also generate local funds to support technology-based programs.

GLOSSARY
of Educational Technology Terms

Backbone System—The basic network that connects major points of communication. A typical network may be terrestrial (telephone lines, fiber optic cable, coaxial cable), microwave, or satellite-based.

CD-ROM—A popular acronym for "Compact Disk/Read-Only Memory." The CD-ROM technology makes it possible to store large amounts of information—including text, images, and sound—on compact disks. CD-ROM storage capacity is so vast that an entire encyclopedia can be stored on a single disk. Computers and software can be used to search, retrieve, and display the information.

Coaxial Cable—Hard underground cable used to carry television signals from one site to another within a limited range. Capacity is much more limited than for fiber optic cable and varies according to size and material make-up.

Compressed Video—Transmission signals are digitized, making it possible for a network to carry more information. Compressed video signals can run over high capacity telephone lines, coaxial cable, and fiber optic cable. Compression technology makes interactive video communications more accessible to business, industry, and the public sector.

C-Band—A satellite frequency operating between 5 and 16 watts. (See *Ku-Band.*)

Distance Learning—Transmission of instruction from a teacher at one site to students at a distant site. Electronic, audio/ visual media for transmission include cable, satellite, microwave, and fiber optic networks. Some networks provide for two-way communication between teacher and students.

Electronic Mail or "E-mail"—Messages that are sent over telephone and computer networks which may be stored and read at the receiver's convenience. Computer bulletin boards often serve as "post offices" for E-mail.

Full Motion Video - Broadcast quality video, like television, that uses analogue signals. These signals provide high resolution images but can tax network capacity. Some forms of compressed video, which can be transmitted using existing telephone lines, are near the quality of full motion video.

Fiber Optic Network - One of the most recently developed transmitting

technologies, fiber optic networks send light signals across networks of thin, hair-like glass fibers. FON systems are noted for high channel capability, durability, and less interference than other electronic media.

Interactive - Mutual or reciprocal communication between and among persons and technologies. In typical usage, "interactive" may refer to a system that is responsive and allows communication back and forth.

Interface - The place or point at which communication occurs between two or more machines or between human operators and machines.

Ku-Band - A satellite frequency operating between 20 and 45 watts. Higher power satellites can transmit to smaller dishes, which reduces the cost of earth station equipment and installation.

Microwave Transmission - A system that transmits high frequency radio waves from a tower at one point through the air to a receiving dish at another site. Transmission may be two-way, with both sites having a tower and a dish. Distances range generally from 15 to 30 miles, and multiple towers and dishes may be used to relay transmissions over longer distances. Inclement weather or other unusual atmospheric conditions may affect transmission.

Modem - A device used to communicate signals from a telephone line to a computer.

Satellite Transmission - Electronic transmission is beamed from origination site on earth to satellite vehicle in space and then directed back down to receiver stations across the country and the globe. Uplink (earth to satellite) and downlink (satellite to earth) allow for a broad range of transmission and large number of channels.

Teleconferencing - Communicating via electronic media. Transmission over satellite and conference phone system usually allows one-way video and two-way audio. The use of computers and modems, as with electronic mail systems, is also a form of teleconferencing.

Sources: National School Boards Association, SREB references.

THINKING ABOUT INTERACTIVITY

Interactivity refers to the level of responsiveness or interface that can occur between technology and the person(s) using it. Interactivity may be thought of in at least two ways:

(1) Within the scope of a communication network that allows users to exchange voice, video images, and/or data across a system linking equipment in several locations (multi-point system); and

(2) Between technology in the form of a stand-alone work station or desktop computer (which may connected to printers, videodisc players, and other "multi-media" components) and the user(s).

Concerns about the first form of interactivity center around the speed and clarity of communications, and typically whether video images can be exchanged in both directions. For example, satellite-based systems would require an uplink (costing between $300,000 and $500,000) at each location for each site to exchange video images. The application of microwave technology could reduce some of these costs. Commonly, satellite broadcasts originate in a single location, but may be received by an infinite number of distant locations equipped with satellite downlinks. Other technologies (microwave, coaxial cable, fiber optics, and high capacity telephone lines) allow two-way exchange of video images.

The second form of interactivity has been defined by government and university groups and reported by the Institute for Defense Analyses:

Level 0 - A videodisc system intended to be played from beginning to end without interruption.

Level 1 - A videodisc system equipped with still/freeze frame, picture stop, frame and chapter search, dual channel audio, but no programmable memory. Functions performed manually from the videodisc player keypad. Picture stop and chapter stop are read from the videodisc.

Level 2 - A videodisc system with programmable memory. The videodisc player (VDP) memory is programmed by 'digital dumps' from audio channel two of the videodisc or by manual entry from the VDP keypad. Inputs are made from the keypad or from a device that emulates the keypad.

Level 3 - A videodisc system in which the videodisc player is connected to an external computer. The videodisc player acts as a computer peripheral with its functions under the computer's control.

Level 4 - A videodisc system in which the videodisc player is connected to an external computer. The videodisc functions as both an optical storage device for digital information and as the source of analog picture and sound. The video frames on the videodisc store data intended to be read and processed by the computer.

STATE SUMMARIES

ALABAMA

Higher Education

Recent personnel changes within the Alabama Commission on Higher Education have resulted in reassigning of responsibilities for the study and use of educational technology in the state's higher education system.

Technology studies published in 1988 have not been updated and policies for use of telecommunications in higher education have not been adopted. Currently, the Commission has no major initiatives underway on the use of technology and telecommunications.

While there is some interest in exploring further possibilities for using telecommunications in Alabama higher education, it is doubtful that the state legislature will appropriate funds to support planning and development.

The Schools

In 1991, a statewide committee of about 30 individuals representing the K-12 education community and business was appointed to develop a technology plan for the public schools.

A planning report generated during a two-day meeting of the committee has been submitted to Alabama's State Superintendent of Education. He was expected to issue a final policy report by the end of 1991—following a meeting of Chief State School Officers on improving student performance through learning technologies. It is hoped the policy statement will result in more federal funding to support educational technologies.

Currently, Alabama has no specifically designated state funds to support educational technology in the public schools. In 1992, the State Department of Education is expected to submit a multi-year request to the legislature for about $7 million annually for educational technology.

This year Alabama Public Television (APT) requested $2 million to pay for public school memberships to the Satellite Educational Resources Consortium (SERC) for distance learning. The request, however, was not included in the state's final budget. While most public schools have satellite receive dishes, only 10 schools are expected to participate in satellite learning this year.

Arkansas

A state technology planning committee (composed of heads of state agencies) has completed a preliminary study of technology needs. The planning report has not been made widely available, but the governor is reviewing a recommendation to form a second ad hoc committee, composed of educators, technologists, and vendors, to examine cost issues, institutional politics, and issues regarding corporate involvement.

The preliminary report of the state technology planning group included input from higher education, vocational-technical education, K-12, and the Arkansas Educational Television Network (AETN). The report summarizes uses of technology for conventional classroom instruction, distance learning, integrated learning systems, and individualized instruction. It also discusses access to information (data bases, networks, and libraries), management components, technical support, and research and development issues related to technology.

Higher Education

A number of colleges and universities in Arkansas, along with the AETN, are using satellite, cable, and broadcast television for instruction, teleconferencing purposes, and faculty development. AETN also provides telecourse instruction for high school dropouts and adult non-readers.

Local- and wide-area networks allow colleges and universities access to data and library information throughout the state. Some 19 colleges and universities in Arkansas, representing 86 percent of the state's student enrollment, have formed an academic research network that is also linked to the National Science Foundation Network (NSFNET) for national and international information exchange.

The Schools

In K-12 education, IMPAC Learning Systems, Inc. (a state non-profit corporation which provides Arkansas school districts with technology-based services) recently announced several new vendor partnerships with Jostens Learning, the Minnesota Educational Computing Corporation (MECC), and Ideal Learning.

School districts may now choose a network-managed basic skills program for grades 3 through 8 from either IMPAC Learning Systems or Jostens Learning. Ideal Learning is working with IMPAC on a multi-million dollar software development program.

IMPAC has also established vendor relationships with the Tandy and IBM corporations, in addition to its long time relationship with Apple Computer. According to IMPAC, the state's 1989 student/ computer ratio for grades K-12 was 15/1 ranking it ninth in the nation based on two national survey reports (see Table 1 for ratio and rank reported by Quality Education Data).

IMPAC's budget for 1992 and 1993 will include:

- state appropriations of over $2.9 million for hardware and software projects,
- $500,000 to $750,000 in state-appropriated operating funds, and
- about $500,000 in generated revenue.

IMPAC is expecting a $1.4 million budget shortfall in FY93. On two past occasions, IMPAC received special funding appropriations—once for $1 million and another time for $250,000—to meet fiscal shortfalls.

The Arkansas legislature has also authorized $250,000 (FY91-92) and $500,000 (FY92-93) which may be used by school districts to purchase technology equipment.

Administratively, the Department of Education and the Division of Vocational Education are applying uniform standards for collecting, analyzing, and synthesizing data electronically for management and decision-making purposes.

In 1989-90, 65 percent of Arkansas school districts submitted data for the state's annual school and personnel reports in an electronic format. The Division of Vocational Education is using computer technology to maintain a student enrollment data base, which is managed and controlled by 240 postsecondary schools. The technology also allows the Division of Vocational Education office and vo-tech schools in the state to communicate via electronic mail.

Florida

Higher Education

In 1989-90, the State University System of Florida spent about $166.5 million for information and communication technologies. This includes about $21 million in expenditures by the state's regional data centers for information and communication technologies. Spending was about 2 percent below estimated expenditures for that year. Forty-four percent of these total expenditures were for instruction and research programs.

The largest total expenditures for information and communication technologies (excluding regional data centers) were made by the University of Florida ($50.3 million), Florida State University ($36.3 million), and the University of South Florida ($17.4 million).

In 1990-91, estimated expenditures for educational and general activities by Florida universities included $1 million for the National High Magnetic Field Laboratory, $9.3 million for science and technology instructional equipment, and $11.4 million for data processing services.

The Institute for Food and Agricultural Sciences spent an estimated $1.3 million for science and technology instructional equipment and data processing services in 1990-91. Combined spending for science and technology instructional equipment and data processing services by the University of South Florida Medical Center and the University of Florida Health Center totaled about $1.4 million last year.

Special categories of technology spending within the Board of Regents General Office for FY90-91 included about $1 million for a medical training simulation laboratory, $6.8 million for high technology research and development, $350,000 for the Center for Health Technologies, and about $350,000 for data processing services.

The State University System and the State Department of Education have implemented a state-of-the-art data communications system known as the Florida Information Resource Network (FIRN) to link public schools and higher education. A library automation program, under development for five years, is also helping to broaden access to state library resources through on-line electronic catalogs and data bases.

The Division of Community Colleges has a special appropriations category of $2.8 million for library automation in FY91-92. Estimated expenditures for library automation in FY90-91 were about $3 million.

The Schools

The Strategic Plan for Information Resource Management, which was developed for the Florida Department of Education, estimated total cost for departmental information applications in 1988-89 at over $9 million. Actual expenditures that year exceeded $11.6 million. In fiscal year 1989-90, total information resource management costs for the Department were estimated at over $11 million; the expenditures exceeded $12.5 million. Major cost items in both years included office automation, a fund allocation and reporting system for public schools, a student financial aid data base, and career and certification information systems.

To support technology-based learning in the public schools, Florida has appropriated $10 million for a model schools program and for curriculum reform using learner-based electronic technology. Lump sum general revenue appropriations may also be used by schools and districts for technology purchases.

GEORGIA

Higher Education

The Office for Information Technology, which is a component of the state university system, has developed a three-year electronic data processing plan for public colleges and universities that is updated annually. The Office tracks spending by collecting technology expenditure data from the State Purchasing Office.

In FY90, colleges and universities in Georgia spent almost $41 million on computers, peripherals, software, programming, and repair services. Over $24 million, about 60 percent of the total expenditures, were for microcomputers. Almost $5.5 million (13.5 percent of total expenditures) were for computer repair services. An additional $1 million to $2 million in expenditures for technology by higher education in 1990 were not accounted for in the $41 million total because of reporting procedures used by the State Purchasing Office.

The Office for Information Technology updated its electronic data processing (EDP) plan in 1991 and compiled expenditure data. The Office expects to make cost estimate and expenditure comparisons for technology from the planning update and new expenditure data. It also expects to have additional information on networking and telecommunications expenditures.

One noteworthy project is a distance learning system being developed by the University of Georgia, the Georgia Institute of Technology, and Morris Brown College. The planned system is multi-point and fully interactive. Two Atlanta high schools, Southern Bell, and NEC America are partners in the project.

The Schools

The Georgia Department of Education has developed its five-year strategic plan for technology, but the plan is considered irrelevant at the moment, given the state's estimated $500 million budget deficit.

In 1990, the Department released a three-year electronic data processing plan for which it budgeted over $4 million in FY91 funding. The Department of Administrative Services budgeted $1.3 million in the same year to support the plan. The State Department of Education requested an additional $7.5 million for FY92, but received only $5.3 million. About $500,000 of the funds appropriated for FY92 will be returned to the state treasury to help alleviate the current budget shortfall.

In past years, the State Department of Education has made funds available for technology to support instruction. In FY89 and FY90, the Department allocated $850,000 per year for teacher support grants; that increased to $1 million in FY91. Funds were allocated based on application and need. Awards were limited, but each district that applied was usually able to buy one or two personal computers. The Department requested $150,000 for grants this year, but the request was pulled because of the state's budget problems.

Kentucky

State planning groups have estimated costs in the millions of dollars for various information/communication technologies and applications. The Kentucky Information Systems Commission, which is charged with "formulating policy and developing strategic plans to continuously im-

TABLE 1
Microcomputer Density* in Public Schools
United States and SREB States
1990-91

National Rank	States	Students	Computers	Density
	United States	40,780,894	2,089,955	19.5
	SREB States	14,585,214	723,615	20.2
47	Alabama	738,284	27,933	26.4
35	Arkansas	439,260	21,396	20.5
9	Florida	1,783,667	108,036	16.5
38	Georgia	1,143,389	52,914	21.6
7	Kentucky	638,564	41,635	15.3
44	Louisiana	787,701	31,576	24.9
24	Maryland	710,605	37,616	18.9
50	Mississippi	492,748	14,966	32.9
40	North Carolina	1,126,214	50,979	22.1
26	Oklahoma	600,676	31,422	19.1
31	South Carolina	634,527	31,852	19.9
45	Tennessee	840,785	33,099	25.4
23	Texas	3,324,110	177,117	18.8
39	Virginia	994,381	45,160	22.0
22	West Virginia	330,303	17,914	18.4

* "Density" is calculated by dividing the total public school enrollment by the total number of microcomputers.

SOURCE: Quality Education Data, Inc., 1991

TABLE 2
VCR Density* in Public Schools
United States and SREB States
1990-91

States	Students	VCRs	Density
United States	40,780,894	258,440	157.8
SREB States	14,585,214	92,772	157.2
Alabama	738,284	3,766	196.0
Arkansas	439,260	2,682	163.8
Florida	1,783,667	14,765	120.8
Georgia	1,143,389	7,614	150.2
Kentucky	638,564	3,748	170.4
Louisiana	787,701	4,276	184.2
Maryland	710,605	5,835	121.8
Mississippi	492,748	2,508	196.5
North Carolina	1,126,214	6,777	166.2
Oklahoma	600,676	3,609	166.4
South Carolina	634,527	2,950	215.1
Tennessee	840,785	4,072	206.5
Texas	3,324,110	20,466	162.4
Virginia	994,381	6,867	144.8
West Virginia	330,303	2,837	116.4

* "Density" is calculated by dividing the total public school enrollment by the total number of video cassette recorders (VCRs).

SOURCE: Quality Education Data, Inc., 1991

prove the management of government information through the application of technology," estimates that total information system expenditures in the state will exceed $233 million in the 1991-1992 biennium.

Kentucky Educational Television (KET) estimated its FY90 expenditures alone at about $16.8 million and has developed two expansion scenarios. One scenario would expend over $23 million in FY91-92; the other over $117 million through FY94.

Higher Education

Nine western Kentucky school systems, Paducah Community College, and Murray State University have entered into a joint effort to develop a compressed video distance learning system using the public telephone network.

The Schools

The Kentucky Department of Education estimates the cost of the general system design for its management information system at approximately $3 million in FY89-91. The Office of Instruction within the Department estimates the cost of designing and developing its information system for teachers and other personnel at over $2.8 million.

The Kentucky Council for Education Technology has been directed to develop a five-year plan for the equitable and efficient use of instructional and administrative technology in the public schools. About $48 million are available for FY90-92.

Following a Request for Proposals (RFP) process, three Information System Service Providers (ISSP) were selected to develop design and implementation plans by December 1991. A fixed price contract with a maximum $175,000 was awarded to each ISSP. One ISSP will be retained either to provide technical and management assistance for the project or assume responsibilities associated with management and system integration.

Louisiana

Higher Education

The Board of Regents has established a task force on distance learning as one of nine different task forces updating the state's master plan for higher education. The distance learning task force is being chaired by the dean of Continuing Education at Louisiana State University.

The task force is expected to provide an administrative framework for coordinating technology requests within the Board of Regents. The final report and recommendations on distance learning in the state are expected in January 1992.

The Schools

Total general fund appropriations for the State Department of Education are about $1.8 billion for 1991-92, up 2.2 percent over the previous year. A small percentage of these funds goes to support automated information systems for the Department.

Estimated costs for data processing services to support K-12 education (hardware and operating costs from the personal computer to mainframe level) were roughly $6 million in fiscal year 1990-91, and nearly 75 percent of these costs were paid for through state general funds. The remaining costs were paid for through federal funds, trust funds, and interagency transfers.

Discussion is currently underway to establish a state data base committee that would examine the feasibility of a statewide information data base for all agencies.

Louisiana Quality Education Support (often called "8[g]") funds have been budgeted over the past few years to support several technology-based learning projects. Among these projects is a statewide distance learning network providing telelearning in mathematics, science, foreign language, and humanities. The network is also used for honors placement and remedial and vocational education. The network budget was $3 million in 1990-91 and $2.4 million in 1991-92.

State funds have also been used to support Star Schools satellite-based instruction. ("Star Schools" is a federal grant program that provides funds to expand learning opportunities for disadvantaged students through telecommunications). Louisiana's Star Schools telelearning initiative received state funds amounting to over $400,000 in 1989-90, $340,000 in 1990-91, and $300,000 in 1991-92. Some $200,000 was budgeted in 1991-92 for a pilot technology institution that will allow high school students to select academic or vocational career paths as preparation for work or advanced education.

The Louisiana Educational Television Authority (LETA) is authorized to ensure student access to basic and advanced programming in mathematics, sciences, and foreign languages. It also provides teacher in-service training and support services for persons seeking high school equivalency status (GED). Some 1,500 teachers and administrators received in-service and staff training in 1989-90. Almost 500 persons obtained GEDs.

LETA is employing satellite technology to achieve its objectives. Total LETA expenditures in 1989-90 were over $4.1 million. Some $4.6 million was budgeted in 1990-91; recommended funding for 1991-92 is about $4.5 million.

In addition to these agencies, the Louisiana Office of Telecommunications Management (OTM) has been established to provide cost-effective telecommunication services among all state agencies. Acquisition, billing,

and record-keeping for all state telecommunications systems and services are provided through OTM. The Office expended almost $30 million in 1989-90; almost $35 million was budgeted for its operation in 1990-91.

MARYLAND

Higher Education

According to the FY92 operating and capital improvement budget for Maryland higher education, $76,000 was appropriated for high technology grants in fiscal year 1991. Additional funds have not been recommended for 1992.

Ernst & Young, an internationally recognized accounting and management consulting firm, was hired to examine spending for telecommunication technologies in Maryland Higher Education. A final report identifies several key needs including:

- coordinated statewide planning,
- improved cost accounting systems for telecommunications,
- increased use of video technology to improve statewide delivery of education, and
- improved communications between government and education through electronic data exchange, video-conferencing, and electronic mail.

The report recommends several specific initiatives related to voice, data, video, and radio communications. Among these recommendations are:

- conversion to a state calling service to lower intrastate long-distance calls by 50 percent, saving about $600,000 per year;
- expanded coverage and increased use of a digital backbone network to reduce current data circuit costs by about 40 percent, saving $1 million per year;
- a compressed video study examining linkages among community colleges and the University of Maryland System Instructional Television network (funded at a cost of $100,000);
- a plan to develop common satellite uplink facilities ($1 million capital investment and $1 million in additional annual operating costs);

- a radio engineering study to satisfy the state's radio system requirements (approximate cost, $1.2 million); and

- a radio operator facility for communications in times of emergency (cost estimate: $100,000).

The Schools

In K-12 education, there is no direct state funding for school systems to purchase computer hardware and software. A proposal requesting funding of $9.5 million over three years to reduce the elementary school (K-6) student/computer ratio to 10 to 1 from the current ratio of about 29 to 1 will be sent to the 1992 legislature.

Several proposals have been made to develop a distance learning network for the public school system, but no funding support has yet been provided. Several districts in the state are working to set up their own networks. Ernst & Young have recommended that Maryland undertake a digital two-way full motion video study to redesign the State Department of Education regional video network plan (estimated at a cost of $50,000).

Maryland public schools are working with the Carnegie Foundation on a school improvement project that has a technology component, but no funding figures have been attached to this initiative.

Maryland is supporting a teacher development program with a technological twist. Although not initially designed around technology, the program uses videodiscs successfully to deliver training. Maryland has also established a Regional Technology Center with foundation, district, and state support to train teachers on how to use technology. Plans call for four to five of these centers to be established.

Mississippi

General fund appropriations in fiscal year 1990 included $1.5 million for the Executive and Administrative Agency Central Data Processing Authority (CDPA) supercomputer, with an additional $600,000 for support and telecommunications. In 1991, CDPA received $1.5 million from general and special appropriations to support the supercomputer.

The State of Mississippi Budget for FY91 requested over $19 million for the CDPA computer center, support, systems planning, telecommunications, and telephone system as a special fund agency.

Higher Education

In addition to these statewide appropriations, Mississippi universities in FY90-91 allocated educational and general funds for specific technology items.

The University of Mississippi spent approximately $500,000 for supercomputer operational expenses. For fiber optics, Mississippi State University and Mississippi University for Women spent a combined total of $200,000. Both are participating in the Mississippi 2000 project—a public/private initiative involving the universities, several public high schools, BellSouth Telecommunications, IBM, Northern Telecom, ADC Telecommunications, Inc., and Apple Computer, Inc.

Courses in speech, creative writing, German, computer applications, and advanced mathematics are being piloted over a fully interactive fiber optic network linking the state universities with the public high schools. In spring 1991, over 200 students were being taught over the network.

The Schools

Public education received an additional $1.5 million of state support in fiscal year 1991 for IBM's Writing to Read Program to help elementary school students learn to read and write stories by typing and matching words on computer and listening to tapes.

A statewide study conducted by the University of Mississippi has shown that writing achievement and attitudes were better among elementary students in the Writing to Read Program then among students who received traditional instruction.

Fiscal year 1990 state-level spending included $5.5 million in general and special fund appropriations for the Mississippi Educational Television Authority (ETA). In fiscal year 1991, ETA received over $5.7 million in state appropriations.

North Carolina

At the request of business and industry, an Advisory Council on Telecommunications in Education was created by the governor to establish a statewide telecommunications plan over the next two years.

The Council includes personnel from the State Department of Education, education advisors to the governor, the president of the University of North Carolina System, the president of the Department of Community Colleges, and the president of the Microelectronics Center of North Carolina. Committees are outlining specific needs, feasibilities, and evaluation components.

Higher Education

Several corporately supported distance learning projects are also being developed to support interactive video communications between state universities, community colleges, and public high schools. The network is being designed to promote educational equity.

The Schools

The most recent technology inventory by the Department of Public Instruction shows that, over the past year, about 13,000 new microcomputers were placed in public schools, bringing the total to over 91,000. This results in a student/computer ratio of 11 to 1, substantially better than 1990-91 estimate of over 22 to 1 reported by Quality Education Data, a Denver-based marketing information firm.

Expenditure data are not collected as part of the inventory, since past estimates have proved inaccurate. Instead, the four computer companies with state contracts provide the Department of Public Instruction with quarterly sales reports. The Department compiles a report of annual expenditures to provide a clearer picture of how much is actually spent.

The Agency for Public Telecommunications (APT) is responsible for providing state agencies with telecommunication facilities and services. Unlike some state agencies, APT has been able to survive major budget cuts this year. In FY89-90, APT's budget was about $1.7 million. The Agency's estimated budget for FY90-91 was about $1.4 million. Actual expenditures were about $100,000 less; cancellation of an $87,000 federal contract made up the bulk of the shortfall.

The Agency received about $500,000 in state appropriations in 1991, $600,000 in service revenue from other state agencies, and an unspecified amount of funding from outside grants. A major part of the budgets for FY89-90 and FY90-91 included the cost of a $750,000 satellite uplink funded through federal and state dollars; roughly two-thirds of the cost was allocated to the FY89-90 budget year.

The Department of Public Instruction and the Agency for Public Telecommunications worked together this year to provide a three-hour media workshop telecast for instructional personnel. Using satellite technology, the Department saved thousands of dollars in staff time, travel expense, and facilities costs.

Technology can be used in a cost effective way to provide some public services during a time of severe state budget cuts, but technology programs are not immune from cuts themselves. North Carolina's fiscal summary report for FY91-92 and FY92-93 shows a 7 percent reduction in the governor's recommended budget for public television. Actions taken by the 1991 legislature would reduce recommended public television funding by $566,484 in FY91-92 and $579,556 in FY92-93.

Oklahoma

Higher Education

State funding for higher education, which will exceed $562 million in 1991-92, will include $24.1 million in one-time funding for research, libraries, and equipment.

In 1990, the state appropriated $750,000 for expansion of a fiber optic network linking institutions of higher education. One-time state appropriations for special technology programs in 1991-92 included a fiber optic program (now in a mid-level development stage) linking universities and some state agencies in Oklahoma City and Stillwater ($510,000), the Stillwater Telecommunications Project ($510,020), and the Panhandle Telecommunications Project ($100,000 in second year funding).

The Schools

The governor has recommended spending $50 million to strengthen statewide communications in public schools. Funding would be raised through capital bond issues. The state has also expanded definition of textbooks to include instructional computer software.

The Educational Television Authority within the Department of Education received appropriations of $2.7 million in fiscal year 1991, and the recommended state appropriation for FY1992 is just over $2.6 million. The governor has also recommended that the state use capital bond issues to raise $4.1 million to replace system transmitters and other television equipment.

South Carolina

Higher Education

South Carolina's Commission on Higher Education has issued a *Proposal to Coordinate and Fund Distance Learning Activities*. The Office of Information Technology Policy and Management (ITPM) within the State Budget and Control Board responded with a report that includes findings from a survey of state agencies and institutions of higher learning regarding current and projected use of video resources for distance learning and other programs.

The estimated FY90-91 budget for video resources and services in higher education totals over $3.6 million; estimates for expanding video facilities and resources through FY95-96 exceed $18 million.

Due to growing need and the high cost of video technologies, South Carolina recently passed legislation giving the Office of Information Technology Policy and Management and South Carolina Educational Television (SCETV) authority to approve all expenditures by any state entity for video technology and for related resources, regardless of source.

The ITPM report recommends that funding for video transport services be based on the use of these services by state agencies, rather than through direct, across-the-board appropriations. It is believed that this will result in more equitable distribution of video resources.

The report also recommends that two categories of video transport services be established: (1) microwave and satellite based services, which would be funded through direct state appropriations, grants, and use

fees; (2) "compressed" video transported over voice and data circuits that would be provided on a full cost recovery basis.

The Schools

The South Carolina Department of Education's Office of Instructional Technology conducts an annual statewide computer survey for public education. The 1989-90 survey indicated a 15 to 1 student computer ratio in grades K-12, somewhat better than the near 20 to 1 ratio reported in 1990-91 by Quality Education Data.

Tennessee

Higher Education

Tennessee higher education experienced severe budget reductions in FY91-92. The governor's original funding recommendation for higher education was reduced by over $168 million. Among the projects not funded was a technical and community college telecommunications network, which would have cost about $2 million.

A 1989 report by the Higher Education Commission proposed that additional study and analysis be undertaken to examine the feasibility of a statewide telecommunications network. The report also proposed an On-Line Computer Library Center network and recommended $2.6 million in funding. To date, the network has not been implemented.

The Schools

The State Board of Education Master Plan for Tennessee Schools, published in November 1990, calls for using technology: to improve instruction and learning in all schools, to deliver professional development, to manage schools and school systems, and to link all schools through a statewide information network.

The plan estimated the cost for applying technology in all instructional areas at $20 million in FY91-92, $40 million in FY92-93, and $50 million in each additional year through FY95-96.

The plan's estimated cost for installing distance learning was about $10,000 per school; the cost of providing each course has been estimated at about $4,000 annually. The plan was projected to cost $560,000 in FY92 and $220,000 annually thereafter for distance learning technology.

About $500,000 was authorized to study the feasibility of using technology to improve the management of classrooms, schools, and school systems and to improve communications between schools, systems, and the state. A study has been commissioned, but findings have not been formally released. Project costs are estimated in the hundreds of millions of dollars. Federal, state, local, and business support will be required. If funded, the system will be phased in over a 10-year period and include 17 applications, ranging from student to facilities management.

Currently, Gibson County is developing a distance learning system in five school districts using interactive compressed video technology as a way for high schools to share resources and offer more instructional options. Courses in calculus, contemporary social issues, and advanced English were pilot-tested in 1990.

Texas

Higher Education

In higher education, select universities are taking the lead developing voice/video/data networks. The Texas A&M University System has created the Trans-Texas Videoconferencing Network linking the system's components across the state. The network development was driven by expansion within the Texas A&M System and the need to share super-computing resources not available to all campuses.

Video and voice components of the network ride free on what is fundamentally a statewide data network operating over leased telephone lines. The network allows fully interactive 2-way communications 24 hours a day. Total capital and installation costs for the network were about $1.5 million. Vendor selection was based on several criteria that included: existing strength of the corporate liaison, proximity to the system providers, system features not available from other vendors, and better service agreements after the sale.

Hardware costs for each of 13 sites were about $65,000. Each site's annual operating expenses, including the leased telephone line and network support services, are about $25,000 per year.

The University of Texas and Texas Tech University Systems may join the network and Regional Education Service Centers serving the public schools also may be linked to the network.

The Schools

A Senate bill calls for the development and expansion of an Integrated Telecommunications System (ITS) to serve public education in Texas. The ITS network will include various telecommunication technologies capable of providing 1-way video, 2-way voice/data communications.

A five-year implementation plan, designed by an outside engineering consulting firm, calls for the development of a hybrid satellite/terrestrial network to serve all public schools in Texas. A $1.8 million funding request to develop the initial component of the plan in FY91-92 is being finalized.

The emphasis in 1990-92 is on Television Receive Only (TVRO) technology and on a production studio and uplink facility. For FY93-95,

emphasis is on expanding facilities, developing a microwave network based on distance and school district density, and establishing 2-way video networks with fiber optic technology through telephone or cable companies.

The Texas Education Agency's (TEA) appropriations requests to the legislature for technology-based systems for FY92-93 are as follows:

- *Electronic Information Transfer System:* Statewide information transfer system to exchange electronic mail, share electronic bulletin boards, and access information data bases within and among districts, Regional Education Service Centers, and the TEA. $4.5 million per fiscal year.

- *Integrated Telecommunications System:* A statewide (primarily satellite) system will link the TEA, school districts, and Regional Education Service Centers for distance education, conferencing, in-service training, and technical assistance. $8 million per fiscal year.

- *Texas Center for Educational Technology:* Research and development consortium that includes companies dealing with hardware, software, textbook, and testing, public school districts, higher education institutions, and the TEA will promote and test innovative applications of existing and emerging technologies in public schools. $400,000 per fiscal year.

- *Standards and Purchasing:* Two statewide committees, the Software Advisory Committee and the Advisory Committee on Technology Standards, will develop standards for the selection of hardware, software, courseware and services to be used in school districts. $491,500 per fiscal year.

- *Technology Preview Centers:* Demonstration and technical assistance centers will promote the implementation and effective use of technology for both administrative and instructional purposes. $2.6 million per fiscal year.

VIRGINIA

Virginia's budget bill approved in the 1991 session of the General Assembly session included several items directly related to educational technology.

Higher Education

In higher education, several technology-related capital projects sched-

uled to be financed through lottery revenues have been deferred due to revenue shortfalls. These projects include $96,000 in classroom and laboratory equipment for Old Dominion University and a science and technology building at George Mason University estimated to cost about $6.6 million.

The Schools

Financial assistance for educational telecommunications in public schools is being funded at about $2.7 million in FY91-92, and at almost $3 million in FY92-93. As outlined in Virginia's Six- Year Plan for Educational Technology, the Board of Education has also been directed to include over $4.7 million in FY91-92 and $5.8 million in FY92-93 to finance technology equipment for local schools.

The Six-Year Plan refers to a 1988 assessment by Virginia Polytechnic Institute and State University indicating that Virginia schools had already invested about $79 million in technology. Other information provided by the House Appropriations Committee and Virginia Department of Education indicates that the state budgeted $3.3 million in general fund revenues in 1988-90 and $4.7 million in 1990-92 for operating the Virginia Satellite Education Network (VSEN). Over $2.4 million in non-general fund revenues were spent between 1988 and 1990 to equip every high school with a satellite dish and electronic classroom. In the current budget biennium, Virginia will spend about $300,000 to pilot a middle school satellite learning initiative.

Microcomputers also represent a major technology investment in the Virginia public schools. In 1988-90, Virginia bought 6,600 microcomputers and 1,500 printers for sixth grade classrooms at a cost of $10 million. Between 1990-92, an estimated 3,400 computers and 770 printers will be purchased for grades 5, 7, and 8 at a cost of $6.2 million. Other costs associated with the micro-computer project include:

- Over $850,000 for teacher training between 1988-92; and
- About $400,000 for software licensing.

Virginia has also spent over $3 million for its Communications Automation Transition System (CATS), an electronic communications network, that will link schools around the state in an effort to share student, teacher, and financial information. Over $8 million has been appropriated to support the system in the 1990-92 biennium.

West Virginia

Higher Education

The West Virginia Board of Regents has established a satellite network linking 24 receiving sites. The network is operated under the direction of the University of West Virginia State College and the University of West

Virginia College of Graduate Studies. Both graduate and undergraduate credit courses, non-credit courses, and videoconferencing are offered on the network. Public schools are participating in the network by making graduate teacher education courses available to instructional staff.

Curriculum areas include nursing, business management, special education, remedial education, and engineering. Sixteen courses were offered on the network in 1989; some 28 course offerings are planned by 1994.

The satellite network courses are in addition to telecourse instruction provided through public broadcast stations in the state, which also are coordinated by the Board of Regents. A consortium of higher education institutions known as the Higher Education Instructional Television Committee selects the telecourse offerings.

The budget summary in the Board of Regents Telecommunications Plan shows estimated spending for the satellite network at $360,000 in 1990-91, rising to $455,000 in 1993-94. Estimated costs for Higher Education Instructional Television are about $100,000 per year through 1993-94. The plan also calls for almost $3 million in capital equipment between 1989-90 and 1992-93.

Planned expansion of the program includes construction of two additional electronic classrooms, second channel capacity, an editing facility, a remote production van, and a fixed Ku-band uplink.

The Schools

The Department of Education's *Summary of FY1992 Appropriations Request for State Funds* showed about $3.5 million budgeted in FY91 for a computer project at the elementary school level. The governor's recommendation and appropriation request to support the project in FY92 totaled over $7 million.

West Virginia's Appropriations Report for FY1991 revealed that in FY90-91 the Department of Education's Educational Broadcast Authority within the Department of Education and the Arts received over $5.2 million in regular appropriations plus approximately $41,000 in supplemental appropriations.

RECOMMENDATIONS FOR FURTHER STUDY

Educators, managers, and policymakers are becoming increasingly aware of the power of emerging information and communication technologies, and a continuing need to bring visions together through sharing information and comprehensive long-range planning.

A review of state telecommunication plans in SREB states shows that planning strategies need to become more systematic and that there is relatively wide support among telecommunication planners in the SREB region for a systems planning methodology. Information/ communication networks must be connectible and expandable, and resources must be adequate to support maintenance and upgrading of the system.

In both the near and long term, plans will focus on libraries as new electronic services and products become available, and as more emphasis is given to "on-demand" information. Greater consideration will be given to improving access than to owning information, and to providing information services in formats that best meet user needs.

While the entire information structure is changing, many state budgets are shrinking. Consequently, more consideration must be given to cost/benefit issues, since technology is expensive. This begins with knowing how states are planning to use electronic information technologies and how much is being spent. Uniform data collection strategies could be developed with the support of key technology planners and budget officers in the SREB region.

In the immediate term, there appears to be a critical absence of research on faculty interests and an unmet need for evaluative research on the effectiveness and efficiency of the various information technologies.